THREE NEW SPECIES OF THE GEKKONID LIZARD GENUS DIPLODACTYLUS GRAY FROM AUSTRALIA

By ARNOLD G. KLUGE[1], Department of Biology, University of Southern California, Los Angeles, California

Plates 34-35

In preparation for a revision of the large and complex gekkonid lizard genus *Diplodactylus* Gray a study was made of all the specimens deposited in Australian university and museum collections. During this study a few specimens were discovered which apparently represent three undescribed species. It is not surprising that these populations appear to be restricted to two regions already supporting a large number of plant and animal relicts. Two of the species are known only from the Carnarvon and North-West Natural Regions of Western Australia and the third from central Australia. All the new forms belong to the *vittatus* species group which at present includes *byrnei* Lucas and Frost, *conspicillatus* Lucas and Frost, *pulcher* (Steindachner), *steindachneri* Boulenger, *tessellatus* (Gunther), and *vittatus* Gray. This species group is characterized by relatively long and slightly expanded digits with moderately large subapical plates, preanal pores either present or absent and a cloacal spur consisting of a cluster of ridged spine-like scales.

I wish to extend my gratitude to the curators of the following institutions for their assistance during my study tour and for the opportunity to describe specimens under their care: Harold G. Cogger, Australian Museum (A.M.), F. J. Mitchell, South Australian Museum (S.A.M.) and Glen M. Storr, Western Australian Museum (W.A.M.). I also wish to thank A. R. Main of the Department of Zoology, University of Western Australia (U.W.A.) for reading the manuscript.

Diplodactylus galeatus sp. nov.

Holotype: S.A.M. R973. Collected in the Stuart Range, South Australia by Henry Greenfield on 15 October, 1920.

(1) Postgraduate Fulbright Scholar, during 1961-62, at the University of Western Australia.

Diagnosis: *Diplodactylus galeatus* can be distinguished from all other members of the *vittatus* species group by the following combination of characters: (*a*) dosal body scales moderately large and swollen; (*b*) tail relatively long, round in cross section, covered dorsally with regular annuli of slightly enlarged tubercles; and (*c*) a colour pattern consisting of a continuous post-orbital streak over occipital region and a series of large conspicuous circular marks on dorsum of body (plate 34, A).

Description of holotype: Head moderately deep; eye large; snout relatively long; rostral rectangular, slightly more than twice as wide as high; dorsomedian rostral crease absent; nostril small, directed posterolaterally, surrounded by rostral, first supralabial (broadly in contact), two supranasals and four postnasals; anterior-most supranasal large, meeting counterpart on midline (internasal absent); scales immediately posterior to supranasals slightly enlarged and swollen; scales of snout moderately large, 9/11 between postnasals and preocular granules (left and right sides respectively); 8/9 supralabials, slightly decreasing in height posteriorly; 24 scales between centrolateral margins of orbits (excluding those of dorsal eyelids); 2/4 extremely small spinose scales on posterior border of dorsal eyelid; mental almost quadrangular, longer than wide; 10/11 infralabials; scales bordering mental and infralabials slightly enlarged and flattened, gradually grading into small conical granules of throat region; external ear opening relatively small, almost round, slightly below level of angle of jaw; occipital and temporal regions of head covered with moderately large conical scales; dorsal surface of body covered with large swollen scales separated by minute triangular granules (pl. 34, A); enlarged dorsal body scales rapidly grade into conical granules of sides and venter; granules of venter slightly imbricate, one-half times as large as swollen dorsals; limbs covered with relatively small imbricate conical scales; digits relatively long, narrow and depressed; subdigital surfaces covered with single row of enlarged swollen scales; 7/7 swollen scales covering inferior surface of fourth finger, 9/8 covering fourth toe; subapical plates large, much wider than more proximal width of digit; nails extremely short, strongly curved, not projecting distally beyond claw sheath; tail moderately long, slightly swollen at base; tail covered above with large spinose tubercles in regular annuli which are in contact or separated by one or two rows of smaller conical scales; subcaudals approximately one-half times as large as dorsal tubercles; male; cloacal spur

consists of cluster of 8/6 sharply pointed strongly projecting spines; preanal pores absent.

Dorsal ground colour uniform yellowish-brown (probably slightly faded due to preservation); dark brown postocular streak continuous behind occipit, encloses uniform yellow region (plate 34, A); small yellow spot on side of neck; four large light diamond-shaped marks on dorsum of body (one pectoral, two midbody and one pelvic); dorsal surface of tail with faint indication of four irregular enclosed or open large circular marks; all dorsal body and tail colour patterns bordered by very dark brown; all ventral surfaces immaculate white, chromatophores absent.

Snout-vent length 52.7 (all measurements given in millimeters); length of tail 27.0; length of head 14.8; length of snout 5.3; diameter of orbit 4.1; distance between eye and ear 4.8; width of head 10.2; distance between axilla and groin 23.4; length of fore limb 20.3; length of fourth finger 3.8; length of hind limb 25.0; length of fourth toe 4.2.

Variation: In addition to the holotype, *Diplodactylus galeatus* is known from the following specimens: (*a*) S.A.M., R1563, Hermannsburg, Northern Territory and (*b*) A.M. R11995, 4 miles north of Alice Springs, Northern Territory. These specimens agree with the holotype in all important characters and exhibit the following variation: dorsomedian rostral crease one-fourth total height of rostral; two to five, avg. 3.2, postnasals; eleven to twelve, avg. 11.5, scales between postnasals and preocular granules; nine supralabials; twenty-four to twenty-eight, avg. 26.0, scales between centrolateral margins of orbits; three to four, avg. 3.5, extremely small spinose scales on posterior border of dorsal eyelid; mental lanceolate, slightly to much longer than wide; ten to twelve, avg. 11.0, infralabials; scales bordering mental and infralabials small to slightly enlarged; external ear opening very small; dorsal surface of body covered with moderate to very large swollen scales; minute triangular dorsal granules absent or extremely small; sides of body and venter covered with small slightly flattened imbricate scales; seven to eight, avg. 7.8, swollen scales covering inferior surface of fourth finger, eight to eleven, avg. 9.3, covering fourth toe; nails extremely short to long, not or but slightly extending beyond claw sheath; tail relatively short in S.A.M. R1563 (absent in A.M. R11995); annuli of large spinose tubercles of tail in contact or separated by one to four rows of smaller conical scales; subcaudals slightly smaller than dorsal tubercles of tail; both males; cloacal spur consists of cluster of five to six, avg. 5.3, spines; dorsal ground colour uniform yellow or dark reddish-brown; no

indication of spot on side of neck; four to five large light almond-shaped or irregular circular marks on dorsum of body (one pectoral, two to three midbody and one pelvic); dorsal surface of tail devoid of colour pattern.

Relationships: Within the *vittatus* species group, *galeatus* appears to be most closely related to *tessellatus*. This relationship is inferred from their similar head and body proportions and the type of midbody and tail scalation. *Diplodactylus galeatus* can easily be distinguished from *tessellatus* by its peculiar colour pattern (in *tessellatus* the dorsal surfaces of the head and body are uniform or marbled grayish-brown). *Diplodactylus tessellatus* is known from the Everard Ranges, South Australia and Newcastle Waters, Northern Territory.

Etymology: The specific name is derived from the past-participle of the Latin word *galea*, meaning covered with a helmet, thus drawing attention to the occipital cap formed by the continuous dark brown postocular streak (plate 34, A).

Diplodactylus mitchelli sp. nov.

Holotype: W.A.M. R14823. Collected at Coolawanyah homestead, Pilbara Division, Western Australia, by F. J. Mitchell on 17 July, 1958.

Diagnosis: *Diplodactylus mitchelli* can be distinguished from all other members of the *vittatus* species group by its larger size, relatively large and flattened dorsal body scales and colour pattern (plate 34, B).

Description of holotype: Head slightly depressed; eye large; snout long; rostral rectangular, almost two and one-half times wider than high; dorsomedian rostral crease slightly more than one-fourth total height of rostral; nostril moderately large, directed dorsolaterally, surrounded by rostral, first supralabial (broadly in contact), two large supranasals and three postnasals; anterior-most supranasal extremely large, broadly in contact with counterpart on midline (internasal absent); single very large flat scale immediately posterior to supranasals; scales of snout moderately large and swollen, 10/11 between postnasals and preocular granules (left and right sides respectively); 8/7 large supralabials, of equal height to below pupil; 24 scales between centrolateral margins of orbits (excluding those of dorsal eyelid); frontal region strongly concave; 4/3 very small spinose scales on posterior border of dorsal eyelid; mental lanceolate, slightly more than twice as long as wide; 10/10 infralabials, rapidly decreasing

in size posteriorly; two rows of large flattened postmentals, rather sharply defined from small conical granules of throat region; external ear opening very small, oval, at level of angle of jaw; occipital and temporal regions of head covered with moderately large oval scales; mid-dorsal surface of body covered with very large slightly imbricate plate-like scales, two to two and one-half times larger than small imbricate cycloid ventrals; enlarged plate-like scales of dorsal body surface gradually grade into smaller and more imbricate scales of sides of body (plate 34, B); limbs covered with moderately large slightly imbricate conical scales; digits very long, narrow and depressed; subdigital surfaces covered with single row of enlarged swollen scales; 8/9 swollen scales covering inferior surface of fourth finger, 8/9 covering fourth toe; subapical plates very large, much wider than more proximal width of digit; nail very short, strongly curved, not projecting distally beyond claw sheath; tail regenerated—very short and bulbous, covered with large swollen square scales forming regular annuli (plate 34, B); male; cloacal spur consists of cluster of 7/6 sharply pointed strongly projecting spines; preanal pores absent.

Dorsal ground colour reddish-brown; dorsal surface of head uniform light brown; dark brown postocular stripe very conspicuous, ending abruptly above ear opening; vertebral region of body white, projecting laterally in form of serration, bordered by dark brown (pl. 34, B); dorsal surfaces of fore limbs almost uniform light brown, obvious irregular dark brown spots on dorsal surfaces of hind limbs; throat region immaculate white, all other ventral surfaces sparsely covered with brown chromatophores, most heavily concentrated on palms and soles.

Snout-vent length 60.5 (all measurements given in millimeters); length of tail 27.2; length of head 17.1; length of snout 6.2; diameter of orbit 4.4; distance between eye and ear 5.8; width of head 11.3; distance between axilla and groin 27.8; length of fore limb 23.3; length of fourth finger 4.9; length of hind limb 29.4; length of fourth toe 5.3.

Variation: In addition to the holotype, *Diplodactylus mitchelli* is known from the North West and Pilbara Divisions from the following specimens: (*a*) U.W.A. (uncatalogued), Shothole Canyon, 12 miles north-northwest of Learmonth, North West Cape, (*b*) S.A.M. R4280 and W.A.M. R14824, Coolawanyah homestead, and (*c*) S.A.M. R4281, at waterhole in Tambrey Creek at Tambrey homestead. These specimens

agree with the holotype in all important characters and exhibit the following variation: rostral slightly more than twice to more than two and one-half times wider than high; dorsomedian rostral crease absent to one-fourth total height of rostral; two supranasals and one to four, avg. 2.3, postnasals; scales immediately posterior to supranasals moderately large and flat; ten to thirteen, avg. 11.3, scales between postnasals and preocular granules; seven to eight, avg. 7.4, supralabials, equal or slightly decreasing in height posteriorly; twenty-four to twenty-eight, avg. 25.5, scales between centrolateral margins of orbits; one to four, avg. 2.5, spinose scales on posterior border of dorsal eyelid; nine to eleven, avg. 10.4, infralabials; postmentals only slightly enlarged to very large and flat; mid-dorsal surface of body covered with moderately large to very large, slightly swollen or plate-like scales, one and one-half to three times larger than ventrals; seven to nine, avg. 8.0, swollen scales covering inferior surface of fourth finger, eight to ten, avg. 9.1, covering fourth toe; tail of specimen from North West Cape unregenerated—relatively short, slightly swollen, dorsal surface covered with large oval slightly imbricate or juxtaposed scales forming regular annuli, subcaudals more flattened and imbricate (tails of all other specimens absent or regenerated and similar to holotype); W.A.M. R14824 juvenile female, remaining specimens adult males; cloacal spur in males consists of cluster of seven to ten, avg. 8.2 spines; dorsal ground colour yellow to dark reddish-brown; postocular stripe absent; vertebral region of body white with lateral serration or an overall reticulation; dark brown spots either present or absent on dorsal surfaces of fore and hind limbs; ventral surfaces of body and limbs with or without sparse covering of brown chromatophores; tail of North West Cape specimen with light brown reticulation similar to dorsum of body.

Relationships: The specific relationship of *mitchelli* within the *vittatus* species group is not clear. Superficially, *mitchelli* appears to be most closely related to *vittatus*, however, there are obvious similarities to both *galeatus* and *tessellatus*.

Etymology: This species is named in honour of Mr. F. J. Mitchell, who collected the holotype and who has made many valuable contributions to Australian herpetology.

Diplodactylus savagei sp. nov.

Holotype: W.A.M. R14369. Collected at Marble Bar, Pilbara Division, Western Australia, by Glen M. Storr on 22 September, 1960.

Diagnosis: *Diplodactylus savagei* can be distinguished from all other members of the *vittatus* species group by the following combination of characters: (*a*) rostral large and hexagonal, (*b*) rostral crease absent, (*c*) anterior nasal present (rostral excluded from nostril), (*d*) only anterior-most supralabial enlarged (not in contact with nostril), all other labials replaced by granules, (*e*) dorsal eyelid undifferentiated, (*f*) spinose scales on posterior border of ocular orbit absent, and (*g*) colour pattern of large irregular white spots (plate 35, A).

Description of holotype: Head moderately depressed; eye small; snout relatively long; rostral very large, hexagonal, slightly less than twice as wide as high; dorsomedian rostral crease absent; nostril large, directed dorsally, surrounded by anterior nasal (rostral excluded), single supranasal and four postnasals; anterior nasal very large, borders first supralabial; supranasal large, meets counterpart on midline (internasal absent); scales of snout small and conical, 11/13 between postnasals and preocular granules (left and right sides respectively); anterior-most supralabial large, remaining labials replaced by 19/20 small granules; 32 scales between centrolateral margins of orbits (including those of dorsal eyelid); dorsal eyelid undifferentiated; spinose scales on posterior border of ocular orbit absent; mental very large, slightly more than twice as wide as long, bordered by seven scales (including first infralabial granule); infralabials absent, replaced by 26/26 small granules; scales bordering mental moderately large, gradually grading into conical granules of throat region; external ear opening inconspicuous, represented by small depression slightly below angle of jaw; dorsal and lateral surfaces of head and body covered with small conical granules (plate 35, A), equalling size of moderately imbricate ventrals; limbs covered with small slightly imbricate conical granules; digits moderately short and broad, very depressed; subdigital surfaces covered with two rows of enlarged swollen scales (plate 35, B); 6/7 transverse series of swollen scales covering inferior surface of fourth finger, 6/6 covering fourth toe; subapical plates large, slightly wider than more proximal width of digit; nail short, strongly curved, not projecting distally beyond claw sheath; tail regenerated; male; cloacal spur consists of cluster of 12/11 sharply pointed strongly projecting spines; preanal pores absent.

Dorsal ground colour dark brown; large irregular white spots randomly scattered over dorsal and lateral surfaces of neck and body

(plate 35, A); *canthus rostralis* and supralabial margin white; interorbital and occipital regions covered with irregular white marks; some indication of small white spots on dorsal surfaces of limbs; ventral surfaces of head and body immaculate white, devoid of chromatophores; ventral surfaces of limbs covered with some chromotophores, becoming heavily concentrated on palms and soles.

Snout-vent length 42.7 (all measurements are given in millimeters); length of head 8.2; length of snout 3.8; diameter of orbit 2.0; distance between eye and ear 2.4; width of head 6.5; distance between axilla and groin 20.7; length of fore limb 13.8; length of fourth finger 2.6; length of hind limb 14.5; length of fourth toe 3.2.

Variation: In addition to the holotype, *Diplodactylus savagei* is known from the Pilbara Division from the following specimens: (*a*) S.A.M. R3464 (2 specimens) Pilgangoora Well and (*b*) S.A.M. R4282 Coolawanyah homestead. These specimens agree with the holotype in all important characters and exhibit the following variation; rostral slightly less to more than twice as wide as high; four to six, avg. 4.5, postnasals; anteriornasal and supranasal separated from counterparts by one to two, avg. 1.3, internasals; fourteen to fifteen, avg. 14.2, scales between postnasals and preocular granules; fifteen to seventeen, avg. 16.2, granules bordering supralabial margin; thirty-one to thirty-six, avg. 33.0, scales between centrolateral margins of orbits; mental slightly less than twice as wide as long, bordered by five to six, avg. 5.3 scales; twenty-five to twenty-seven, avg. 26.5, granules bordering infralabial margin; external ear opening very small; scales covering dorsal and lateral surfaces of head and body slightly imbricate; six to seven, avg. 6.7 transverse series of swollen scales covering inferior surface of fourth finger, seven to nine, avg. 7.8, covering fourth toe; tails absent; all females; cloacal spur consists of a cluster of five to fourteen, avg. 9.7, slightly enlarged soft scales; moderately large irregular white spots distinct or beginning to become confluent; only faint indication of chromatophores on palms and soles.

Relationships: *Diplodactylus savagei* appears to be closely related to *conspicillatus*. This assumption is inferred from their similar rostral shape and absence of a rostral crease, type and arrangement of scales bordering the nostril, absence of enlarged labials, undifferentiated dorsal eyelid, absence of spinose scales on posterior border of ocular orbit, and size and shape of mental. *Diplodactylus savagei* can be distinguished from *conspicillatus* by the size of its subapical plates and the size and arrangement of its infradigital

lamellae (plate 35, B) and its colour and colour pattern (*conspicillatus* is a marbled brown). In the Pilbara Division *conspicillatus* has been collected at Yandeyarra and Mundabullangana Stations.

Etymology: This species is named in honour of Dr. Jay M. Savage, whose interest in herpetology has stimulated all those students who have come in contact with him.

DESCRIPTIONS OF PLATES 34-35

PLATE 34

A. A dorsal view of the holotype (S.A.M. R973) of *Diplodactylus galeatus.*

B. A dorsal view of the holotype (W.A.M. R14823) of *Diplodactylus mitchelli.*

PLATE 35

A. A dorsal view of the holotype (W.A.M. R14369) of *Diplodactylus savagei.*

B. A ventral view of the fourth toe showing the comparative sizes of the subapical plates and subdigital lamellae of *Diplodactylus conspicillatus* and *Diplodactylus savagei* (right).